1 Probabilities by combinatorics

1.1 One mine per cell

We initially consider the classic game, where each cell may contain either zero or one mine ($x_{\mathrm{max}} = 1$). We calculate the probabilities of different configurations occurring by considering the number of ways the mines could be placed to create such a configuration. To demonstrate how we perform this count, consider a new game – a grid with N cells and K mines. Note that there is no need to distinguish between mines. There are then N choices for where the first mine is placed, which will fill the chosen cell. This results in there being $N - 1$ choices for the second mine. Continuing in this fashion, the number of ways to arrange all K mines is

$$\sum_{i=1}^{K} N - i + 1. \tag{1.1}$$